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# THE INTERDEPENDENCE OF HIGH-LEVEL MANPOWER PLANNING AND ECONOMIC PLANNING

By The International Labour Office

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E.

# The Interdependence of High Level Manpower Planning and Economic Planning

The International Labour Office

## I.

1. The first question we face when attempting to "reconcile" high level manpower planning with economic planning is: what is their purpose ? What are we trying to achieve by high level manpower planning, and what by economic planning ?[1] The first, rather intuitive, answer to the high level manpower planning question is that we attempt to balance the supply and demand for high-level manpower. In other words we are trying to achieve a situation where all high level manpower is fully employed, and at the same time where the demand for high-level manpower is satisfied. This answer, however, is not satisfactory. It evades the question of what determines the demand for high-level manpower. A really primitive society has no demand for high-level manpower. A society which is not primitive does demand high-level manpower; the strength of this demand and its structure (i.e. the types of high-level manpower needed) depend on the level of development and on the structure of the economy. An underdeveloped country with a particular economic structure may have a strong demand for one type of high-level manpower, a much smaller demand for another type and no demand at all for still another type. A fully developed country has a much larger general demand for high-level manpower, and also the structure of this demand is usually quite different.

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[1] Some countries are said to use planning in the attempt to achieve the society's "ultimate goals", while other countries are said to abstain from planning. The division is not very clear; countries said to abstain from planning may actually do a lot of planning, limiting it, however, to a small part of the economy, or to sporadic measures affecting the whole economy decided on the basis of a general but rather vague plan. This is true particularly of some of the most highly developed countries which achieved a high level of development without general economic planning, and where the problem of further development consists of maintaining a steady rate of growth rather than of a rapid achievement of particular targets. But in many if not most of the countries in the process of development with which this meeting is specially concerned there is machinery for the drafting and implementing of more or less concrete plans for a specific period, such as five or ten years. In this paper we shall speak for convenience of "economic planning" or "the plan" as though all countries had a definite plan, even though in the case of some countries it would be more accurate to use some such expression as "the intentions of the policy-makers".

2. This dependence of demand for high-level manpower on the level of economic development and on the general economic (and social) structure is true at each point of time. It is thus true about the beginning as well as the end of each plan. During the time between the beginning and the end of a general economic plan the level of development and the economic structure will change, and from this change will result also a change in the demand for high-level manpower.

3. But the rate at which an economy develops and its structure changes depends in turn on a number of factors. It depends on the resources the economy has, on the new resources it develops, on the way in which the economy utilises all resources, and on the goals the society wants to achieve by utilisation of resources. One of the resources - and an important one - is manpower. The economic growth and structural changes which determine the demand for manpower thus depend themselves in part on manpower, including high-level manpower, on the way in which manpower is utilised, on the way new manpower resources are developed.

To recapitulate:

(a) the future supply and demand for high-level manpower are not independent but there are links between them; and

(b) these links are economic growth and structural changes.

4. This finding makes the problem of high-level manpower planning much more difficult as the supply and demand sides cannot (or at least should not) be considered in isolation. At the same time, it becomes clear that the purpose of high-level manpower planning cannot be limited to achieving a balance between supply and demand, it has to be extended also to the level at which supply and demand will balance.

5. The determination of the level at which there is a balance between supply and demand for high-level manpower, as well as for other types of manpower and for other factors of production, is of course the task of the economic plan. The economic plan, regardless of what ultimate goals it serves, seeks to reach a balance between supply and demand for each particular factor of production (including high-level manpower) at a level most compatible with achieving the ultimate goals. The level at which supply and demand for high-level manpower (or for any other factor of production) balance cannot thus be determined in isolation but only with regard to all other factors of production, and in each case the basic criterion has to be the achievement of "the ultimate goals" of the economic plan. The purpose of high-level manpower planning is thus the same as the purpose of economic planning.

6. This may seem a rather surprising statement, unless we consider what is the purpose of economic planning, and in fact what is economic planning itself. The purpose of economic planning is to achieve certain "ultimate goals"[2] which the society desires. These

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[2] Or "ultimate aims" in Tinbergen's terminology, or "fundamental aims" in the terminology of Oscar Lange.

goals may be expressed in very general terms, such as "a high level of development", "a high standard of living" or "full satisfaction of material and cultural needs". Such terms provide a general sense of direction in which the society wants to develop, but in order to be usable as criteria for practical action they have to be translated into more concrete terms. First, it is realised that such goals cannot be achieved this year, next year or within the next five years. If action is to be taken this year or within the next five years, it must be decided what to do in the near future to achieve the goals in a more distant future. The second point is even more important. The different elements in such a broad "ultimate goal" as a higher standard of living - e.g. a high level of employment, high wages, a high level of production, short working hours, good housing, general education, etc. - may be combined in different ways and may conflict one with another in the conditions of limited resources.

7. For practical action the "ultimate goal" must be therefore translated into more concrete targets or objectives which express the weight which the society attaches to each particular ingredient of the "ultimate goal". Targets or objectives need not be (and usually are not) purely economic; they may involve social, cultural and other considerations. The purely economic target may be expressed in a single formula: achieve the fastest growth of national income (or of G.N.P. or some other over-all measure of national economic performance). To this may be added other targets, setting specific social and other goals. The total plan might include as targets:

(i) maximum growth of G.N.P.;

(ii) at least five-year education for all children;

(iii) university education for at least 2 per cent. of the 23-year olds;

(iv) an old-age pension ($x p.a.) for everybody over 70;

(v) expenditure of $y p.a. for the armed forces.

8. There is, of course, a virtually unlimited number of possible combinations of targets. But such targets are not always consistent - target (v), for example, may conflict with (i). It will then be necessary to specify which are the over-riding objectives and which are to be achieved as far as is compatible with the over-riding ones (and, of course, to ensure that the over-riding objectives are mutually consistent).

9. The whole economic plan has as its purpose the attainment of all targets, and the high-level manpower plan must be geared to this same objective. The targets relating more specifically to high-level manpower and the resources available for attaining these objectives (the number of students to be trained, the number of potential teachers coming forward, and so on) will be derivable from a comprehensive plan. But it will be easier for the manpower planner if the educational targets are over-riding targets than if they are subsidiary ones. Different approaches to solving the problem of interaction between high-level manpower planning and general economic planning will be discussed in the next section.

10. Apart from the targets or objectives of each plan, there is another important element in planning - the means through which blueprints of plans are translated into reality. There are two basic aproaches to plan realisation: through compulsion and through inducement. In practice hardly any country will resort to one approach only, even in the same field: import restrictions (compulsion) and import duties (i.e. "negative inducements") may be used side by side. In the field of high-level manpower the inducement approach predominates, compared with direction of labour to particular jobs. In the inducement approach the most obvious element is the wage or salary differential which offers inducement to young people to study and acquire "high-level" qualifications and which could also be used to induce young people to study subjects where there is a serious shortage - e.g. agriculture, engineering - rather than subjects where the shortage is not so pronounced.[3] Scholarships may also be offered as inducement to people to acquire needed qualifications. When compulsion is used it does not have to extent to directing individuals to particular jobs. In countries where universitites are being established or extended the government may directly influence the allocation of students among subjects by limiting the number of places in some faculties and expanding the number of places in others. The government can use some compulsion not only in high-level manpower formation, but also in high-level manpower allocation. Firstly, being itself a large employer of high-level manpower, it has direct say in the allocation of a high proportion of such manpower. Secondly, it can influence the allocation of high-level manpower even outside the government employment, e.g. in a country where there is a shortage of doctors, who moreover tend to settle in towns leaving the rural areas without medical care, the government can achieve a more desirable distribution of doctors by limiting the number of licences to practice medicine in towns, and thus forcing new doctors to settle in rural areas.

11. On the whole, if enough attention is paid to the problem, there is no reason why the armoury of inducement and compulsory measures should not be extended to such an extent that high-level manpower is formed and allocated according to plan, without recourse to direct allocation of particular individuals to particular jobs.

12. There is a third element (after "objectives" and "measures") in planning which we should notice at this stage: time. Time enters into planning through two considerations: through the "time-preference" and through the "time-unit of planning". The first aspect, the "time-preference", is of course vitally important for the whole field of planning. The problem of allocation of resources between consumption and investment depends on the time-preference of the society. Just as an individual may be asked whether he prefers $100 now and $500 in ten years' time, or $200 now and only $300 in ten years' time, so a society has to decide, for example, whether it is willing to sacrifice some primary education two years hence for the sake of having more secondary education five years hence. Similar problems can also be faced in matters of health, housing and other

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[3] Or where, as is the case in some Asian countries, there is actually unemployment among graduates.

areas. But as soon as we attach a particular value to each consideration (e.g. to general five-year education, or to a comprehensive medical service) the problem is soluble on the basis of a single criterion of the time-preference - the rate at which we discount future benefits to make them as desirable as smaller, but immediate, present benefits. This rate of discount should be - and in fact usually is - incorporated in the general economic plan.[4] It determines the present value of the series of returns to be expected in the future from alternative courses of action in the area of high-level planning as in other departments of planning. Thus time-preference as such does not offer any particular problems for high-level manpower planners.

13. The same, however, is not true of the other aspect of time, the "time-unit of planning", that is the period for which a plan is drawn. Here we face a possibility of a difference between the arbitrarily-given period of the general economic plan and the period which is for technical reasons necessary for education of high-level manpower. When the "education period" is longer than the "economic plan period", two types of difficulties may appear.[5]

(a) in the absence of the future economic plan, high-level manpower planning is faced with the task of providing a supply to match an unknown demand;

(b) looking only at how much high-level manpower is needed to attain the targets of the current plan, planners may tend to neglect the training of the additional high-level manpower needed for the next planning period, since such training represents an input not matched by any output in the current plan.

14. The second of these difficulties could be taken care of by introducing into the current plan provision for the training of some high-level manpower over and above what will be needed for the current period. But the question remains: how is the magnitude of this provision to be determined in the absence of general economic planning for the next period? There is no fully satisfactory answer to this. A very rough-and-ready solution would be to use the figures of estimated demand for particular types of high-level manpower in all individual years of the current plan for trend calculation and extrapolation. Such a solution would, of course, be based on the unrealistic assumption that the future economic plan would follow the same path as the current economic plan. For this reason it seems preferable to adopt a solution based on the existence of two types of economic plan. The first would be the

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[4] This may not be visible at first sight. But if the plan stipulates, e.g. the rate of growth of national income and of investment, the difference between the two rates implies a decision on the rate of discount.

[5] Such difficulties are not confined to high-level manpower planning, but arise in connection with all investments whose gestation period is longer that the time limit of planning.

existing economic plan covering the period of, say, five years, and the other would be a longer-term general economic plan covering about 20 years. Of necessity the 20-year plan would have to be much less precise and less detailed than the five-year plan. Nevertheless, it should show the main proportions between the various aspects of the economy during the next 20 years, and thus provide a consistent basis for elaboration of the operative five-year plans, particularly in the fields such as high-level manpower formation, where the gestation period of investments is longer than the period of the operative plan. In this way high-level manpower objectives could be formulated on the basis of the 20-year plans and incorporated into the targets of the operative five-year plans.

15. One final point. We have spoken of the gestation period of investments in training high-level manpower, and of the present value of the series of future returns expected from such an investment. This does not of course imply that a purely materialist calculus can or should be used in determining the volume of resources to be devoted to education and training, or the allocation of these resources among different levels and specialities. After all, education is a consumer good as well as an investment.

## II

16. In the first section it was said that high-level manpower planning and economic planning have a common purpose - namely to achieve certain "ultimate goals" of the society. These "ultimate goals" are for practical purposes translated into "targets" which may or may not include specific provisions ("sub-targets") concerning high-level manpower. However, even if some specific provisions regarding high-level manpower are included in the target, they are of a very broad character and must in any case be elaborated in more detail in order to serve as a blueprint for action.

17. Although general economic planning and high-level manpower planning have a common purpose, there may be conflicts between the two approaches. The existing structure of skill supplies not being sufficient for the immediate achievement of all economic objectives, expansion in high-level manpower formation is necessary in order to provide manpower needed for expansion in industry, transport and other sectors. This expansion in high-level manpower uses scarce resources (notably high-level manpower for teaching purposes, but also capital) which the general economic planner allocates with the greatest care among uses, trying to achieve the highest return to society from each invested unit of resources. Choices have to be made not only between sectors but also between techniques of production: a given output in a sector can be achieved with differing amounts of capital and with differing labour resources. For this reason, even if output requirements from a particular sector were known in advance and were considered to be optimal, the requirements of the sector for high-level manpower would not automatically follow.

18. The question arises as to how far choices between different products and different techniques should be influenced by the existing skill structure of the labour force. So far as choice between products is concerned, resources exist to satisfy wants, wants do not exist to utilise resources. It follows that the skill structure should be adapted and developed, as time goes on, to give the community the product-mix it wants, but with due regard for the additional opportunity costs of choosing a product-mix that makes specially heavy demands on high-level manpower by including or emphasising such products as, for example, space travel or nuclear deterrents. So far as choice between techniques is concerned, when a product that satisfies consumer wants equally well can be produced in either of two ways, there seems to be substantial advantage in selecting whichever technique is better adapted to the existing skill structure and thus makes fewer demands on scarce resources for the formation of additional skills. This proposition may need qualification, however, to take account (a) of differences in the arduousness or "disutility" of production by different methods, and (b) of the possibility that resources directed to skill formation to permit the employment of a particular production technique may serve other purposes at the same time. Additional knowledge or skills may be valued for their own sake as consumer goods, and they may in certain cases make a community more adaptable and enhance its capacity for development.

19. The question of reconciliation between economic planning and high-level manpower planning can be reduced to the question: should the economic plan be modified to take account of the structure of skill supplies, or should the latter be modified to conform to the former? Or is a full reconciliation best achieved by a compromise, but with one element being primarily the dominant factor, the "independent variable"?

20. Our discussion (in the first section) of the strong interdependence of general economic and high-level manpower considerations gives an indication that none of these methods of reconciliation can be considered as optimal. The reason lies in the interrelationship between high-level manpower considerations and other economic considerations in planning. Generally, planning has two qualities: consistency and optimisation. A good plan should be consistent; that is, supply and demand of all factors of production should balance, and it should be optimal, that is, the level at which the balance is achieved should in each case be the most appropriate for achievement of the target. Many plans are content with the achievement of balance, i.e. with consistency. Consistency in the plan is a virtue in itself: a non-consistent plan will give rise to difficulties and although some kind of balance will be achieved ex post, this balance will be at a "lower" (i.e. less optimal) level than a balance achieved by following a consistent (although not quite optimal) plan. Methods of reconciliation suggested on the previous page have the merit of consistency. However, these methods are unlikely to lead to an optimal plan, that is to a plan which is not only consistent but also optimal in the sense that it shows the most appropriate levels at which supply and demand for each particular factor balance.

21. The optimal method of reconciliation of economic planning with high-level manpower planning is to treat both as "dependent variable" one on the other. Only in this way is it possible to express the fact that the total demand for high-level manpower, and the pattern of this demand, depend on, inter alia, investment decisions, while investment decisions are in turn influenced by high-level manpower supply. When factors are considered as dependent variables the problem is to find the relationships between them, and then to solve the problem simultaneously. Technically, it would amount to finding the various equations linking high-level manpower supply and demand to other considerations, incorporating these equations into the planning model (which includes also a number of other, non-manpower equations) and "solving" the equations simultaneously. This method of reconciliation of high-level manpower planning with economic planning is inherently superior to any other method, but at the same time it is hardly practicable in the present state of knowledge of economic planning. The successful application of this method depends first of all on the availability of reliable data, not only on the various aspects of manpower but also on other economic phenomena. The second condition is the construction of a very detailed model showing the relationships between high-level manpower and all other economic factors. To this model would be then applied an optimisation technique showing the best pattern of development including the optimal rate of formation of high-level manpower (and its skill distribution) as well as its optimum allocation between alternative uses. The optimisation

technique would in most cases be based on the concept of shadow (or accounting) prices of factors of production, etc., and these would include also shadow prices of the various types of high-level manpower. Under the circumstances of an acute shortage of all types of high-level manpower these accounting prices would be of course very high, much above the existing salaries of such personnel. On the other hand, in those developing countries where there is a surplus of a particular type of high-level manpower (e.g. of lawyers) the shadow prices of such types of highly skilled personnel would be below the existing wage level, and in extreme cases the accounting prices would equal zero. The purpose of these accounting prices of particular skills is to achieve an optimal pattern of formation and allocation of high-level manpower, not to determine the actual salaries to be paid to people with particular skills. Nevertheless, the accounting prices can give some indication about the relative importance of different skills for economic development and thus indicate the direction in which particular salaries or wages could be modified under a flexible wage policy.[6]

22. In view of the difficulties of applying the first method because of shortage of reliable data and particularly because of the limitations of present programming techniques for processing data in the degree of detail required, we have to look for another method.

23. The second method of reconciliation, less demanding on planning technique, but possibly more laborious and definitely "less optimal", attempts to approximate to simultaneous solution of planning problems without actually using the simultaneous solution method. It does not take the economic plan as an "independent variable" to which the "dependent variable" of high-level manpower planning has to be linked, but proceeds by taking in turn the considerations in the economic plan and the considerations in the manpower plan as independent variable and the other as dependent variable, repeating the process several times. The use of high-level manpower information as alternatively a dependent and independent variable in relation to other economic information could, given a sufficient number of repetitions, give the same result as the simultaneous solution method. In practice it will not be possible to repeat the process more than a few times at the best, and the resulting plan will therefore remain some distance from the optimal solution.

24. What form this method of reconciliation will take in practice depends on the form of general economic planning in each

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[6] This modification of the salaries pattern in the light of accounting prices of high-level manpower corresponds to Harbison's recommendation that salary scales should reflect the "importance of the job" and not the extent of the individual's formal education, such as the number of degrees he possesses, etc. (F. Harbison: "The Strategy of Human Resources Development in Modernising Economies", Problems of Accelerated Growth and Manpower Planning in Developing Economies, The Institute of National Planning, Cairo 1962, p. 13.

particular country. Basically this method rests on considering higher education (or high-level manpower formation) as one economic sector, the output of which is (a) the input of the other sectors; (b) its own input (e.g. teachers) and also (c) the contribution to the "final bill of goods". (The last-mentioned use of the "education output" is of considerable importance, as it takes care of the usual objection of educationalists that economic development requirements are not the only justification for educational expansion.) The method can thus be applied in a number of ways, ranging from some type of input-output model[7] to the Soviet system of balances to less aggregate methods. The interaction between high-level manpower considerations and economic considerations then takes place at various levels, from the national level downwards.

25. However, whatever the type of planning and the corresponding form of reconciliation, there are a number of relations between high-level manpower and economic aspects of development which all types of planning have to take into consideration. Let us, for example, take the case of the construction of a steel mill of a given capacity. How many people of university (or equivalent) educational level will be needed for the construction? What will be the proportion of various skills? If there is another technique of steel mill construction (say, more labour-intensive), will there be different high-level manpower requirements, either in total number or in the proportion of skills? What will be the high-level manpower requirements for operating such a steel mill? Or let us take an example from the supply side. Suppose that manufacturing will require 100 more electrical engineers than could be provided from existing institutions. How many more people will have to attend university and secondary schools in order to provide for the 100 extra electrical engineers, keeping in mind that the secondary school-leavers are also scarce, that there is some wastage and that an increased number of secondary school and university students will require also an increased number of teachers and university lecturers. The additional demand for 100 electrical engineers may thus result in increasing the number of secondary school enrolments by 150, electrical engineering students by 120, of mathematics students by five, of physics students by three, history students by 2, etc. This type of information[8] is important for all types of high-level manpower planning, particularly for our method aiming at reconciling it with general economic planning on as equal a basis as possible. Some of the relations between high-level manpower and

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[7] In that case it may be solved simultaneously and become in fact our first method. But it is possible to use the input-output framework without simultaneous solution.

[8] It will be observed that this type of information has a strong resemblance to technical coefficients in input-output tables. In fact, if planning were done with the help of some input-output model, with a very great number of sectors (education itself being broken into a number of sectors), the answer to each of the questions asked here would represent (after translation into the common unit of the model) a technical coefficient.

economic variables may differ according to the peculiar situation of each country, but many - one may suspect most - will be very similar for most underdeveloped countries. Assuming the continuing existence of planning in developing countries and the acute shortage of high-level manpower in most of them, research into these relationships would be most useful.

26. The second method of reconciliation between high-level manpower planning and economic planning attempts, as we have said, to approximate the optimal simultaneous solution by alternatively taking one independent and the other as dependent variable. The number of these alternatives being limited, there is some point in considering which will be taken first in which role. In view of the fact that resources exist to satisfy wants and not the other way round[9], it seems logical to take, in the first step of the process, the general economic plan as independent variable and to adapt high-level manpower considerations to it. In the second step the imbalance between supply and demand of particular skills is taken into account, and the economic plan is changed, to some extent, in order to remove the imbalance. This may be done either by leaving out or scaling down some projects for which not enough high-level manpower would be available, or by using techniques that are better adapted to utilise available skills, or by increasing training facilities, again of course at the expense of some non-manpower projects, or by a combination of these approaches. Sometimes the reconciliation process ends here, securing, more or less, consistency, but remaining rather far from optimal allocation of resources. The success of such an approach depends to a great extent on the general economic plan having already taken at least some account of the high-level manpower considerations, as otherwise the imbalance in particular skills might seriously endanger the implementation of the plan, or alternatively measures taken to secure high-level manpower balance could disturb balance among other factors in the general economic plan.

27. There is another method of adaptation of high-level manpower planning to general economic planning. This method may provide for cases where the period of gestation of investments in manpower exceeds the period of the plan, and for cases where the general plan is not worked out in detail. It has an advantage in simplicity. It consists of taking the general economic plan and drawing a high-level manpower plan to fit it, not on the basis of elaboration of the economic plan, but rather on the basis of analogy with other countries. The method is based on past experience in other countries showing rather stable relations between economic and high-level manpower factors at a given stage of development. Perhaps the most obvious is the relation between education expenditure and gross national product, which gives the first clue about the percentage of G.N.P. an underdeveloped country can profitably allocate to education.

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[9] This is not of course to deny that some manpower objectives such as education have an intrinsic value apart from what they contribute to economic development.

Table 1

Expenditure on Education as a Percentage of Gross National Product

| | Percentage of G.N.P. |
|---|---|
| Mediterranean countries (Greece, Italy, Portugal, Spain, Turkey, Yugoslavia) | 2.65 |
| All O.E.E.C. countries | 3.21 |
| Soviet Union | 3.74 |
| Canada, U.S.A. | 4.47 |

Source: O.E.C.D.: Policy Conference on Economic Growth and Investment in Education, (1961), O.E.C.D., 1962, Vol. II, Table 9, p. 80.

28. Similarly, allocation of education expenditure between primary, secondary, vocational, technical and university levels can be done with regard to the pattern of expenditure in countries which were at a similar level of development. This approach can be used also for deciding the skill pattern of university graduates, the ratio of university graduates to intermediate level personnel, etc. It is important to realise, however, that these relationships do not necessarily imply any causal connection between education expenditure and economic growth.

29. While the chief value of this approach seems to lie in the help that it may give in overcoming problems resulting from a discrepancy between the period required for high-level manpower formation and the period of a relatively short-term (say five-year) plan, this approach might also be used as a way of harmonising manpower and general economic targets within a shorter plan period. It might be used for this purpose either alone or as a check on the second method of reconciliation. The help of highly developed countries can be particularly useful here, as many of the relations to be applied in underdeveloped countries represent the relations in the developed countries, say 50 years earlier. This method, however, should be used with particular caution and only after a thorough research, in order to take into account differences in economic structure, traditional patterns, geographical conditions, etc. While this method may be of much use, there are probably more conceptual, economic and statistical traps here than in the other methods of reconciliation of high-level manpower planning with economic planning.

742 E - Oct. 1962 - 1,600